

Quarterly Surveillance Report

October 2008

Cancers of the Brain and Central Nervous System

Cancers of the brain and other parts of the central nervous system (CNS; nerves within the skull and spinal cord) are relatively uncommon. In Montana in 2002-2006, the age-adjusted incidence was 7.5 per 100,000 population (95% Confidence Interval 6.8 - 8.3 per 100,000), slightly higher than the national incidence rate of 6.6/100,000.^{1,2} As a group, brain and CNS cancers are the 15th most common type of cancer in Montana. Individually, specific types of brain and other CNS cancers are rare.

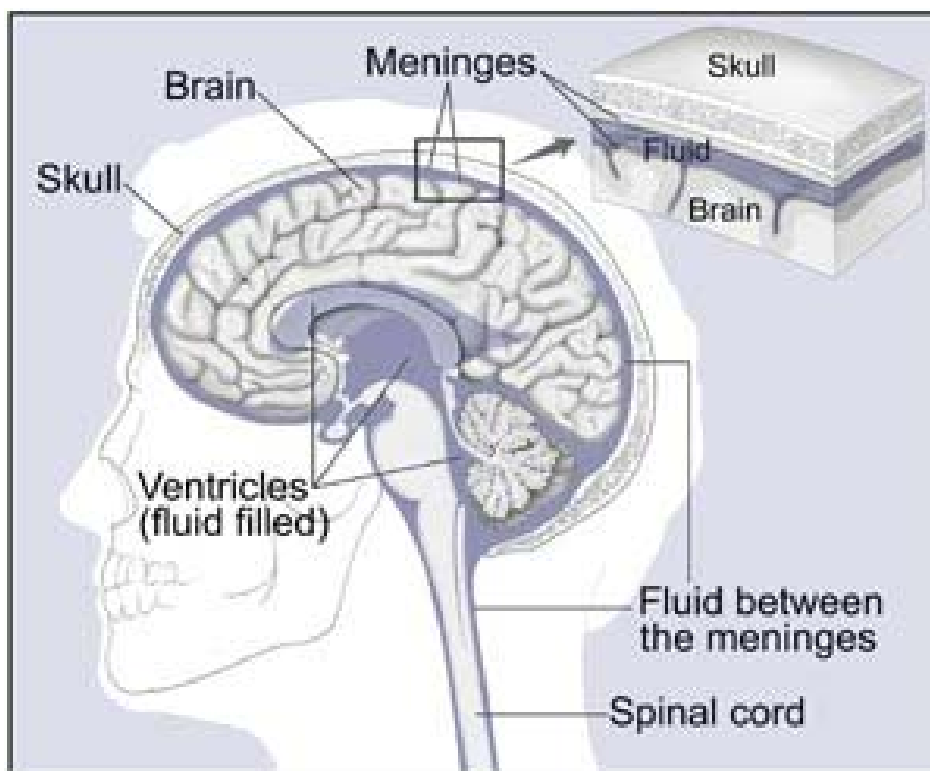


Illustration from the National Cancer Institute

Cancer can develop in any of the cells that make up the brain and CNS. The tumors are generally named for the kinds of cells affected (histology). Some tumors are of uncertain

¹ Montana Central Tumor Registry

² National Cancer Institute: <http://statecancerprofiles.cancer.gov/cgin/quickprofiles/profile.pl?00&076#incidence>

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or mixed origin. As a result, the nomenclature of brain and CNS tumors is complex. The major cell types of the brain and CNS include:

Nerve cells conduct electrical impulses in the brain, the CNS, and the peripheral nervous system.

Glial cells form the non-neural structure of the brain and nervous system. Subtypes of glial cells include:

Oligodendrocytes make fatty myelin that surrounds and protects nerves in the CNS.

Astrocytes (astroglia) provide structural support for nerve cells and perform many metabolic functions in the brain such as providing nutrients to nerve cells and participating in repair to brain and nervous tissue.

Microglia perform the immune functions of the brain and CNS.

Ependymal cells line the fluid filled spaces (ventricles) in and around the brain.

Meningeal cells make up the membrane surrounding the brain.

Schwann cells (neurolemmocytes) make myelin sheaths for peripheral nerves.

Most brain and CNS tumors affect the brain, cranial nerves, or cranial meninges. Only about five percent affect the spinal cord or spinal meninges. Tumors of the peripheral nervous system (outside of brain, cranial nerves, and spinal cord) are very rare.

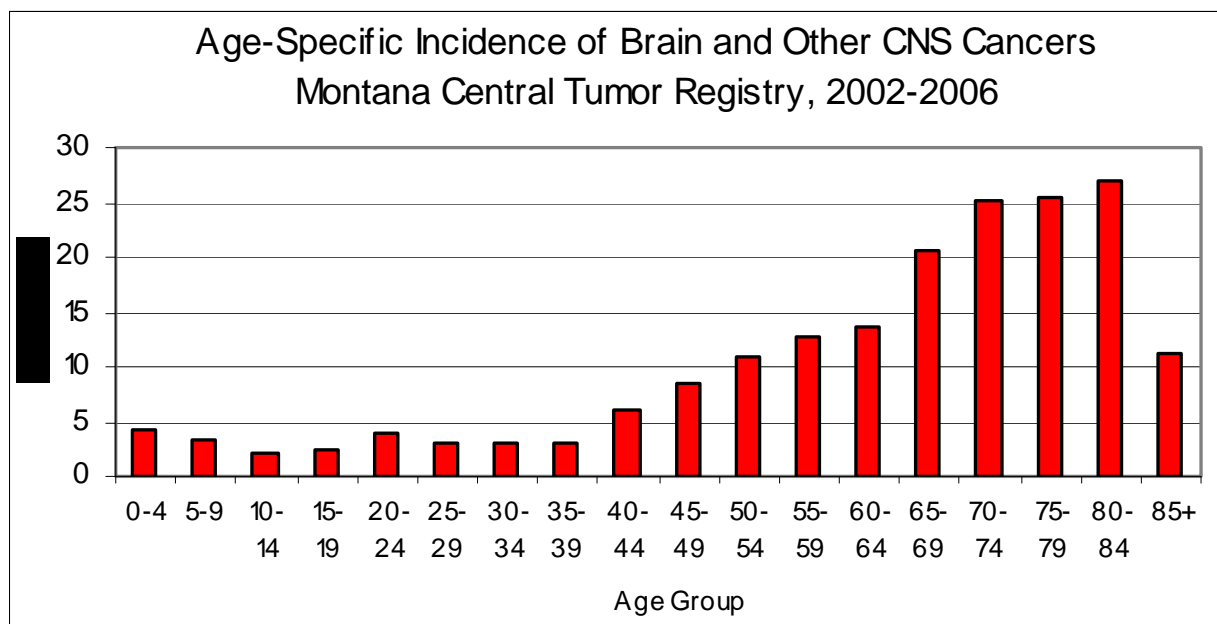
Brain tumors may be benign or malignant. Benign tumors are groups of cells that grow abnormally but do not invade nearby tissues or spread to other parts of the body. Malignant tumors are invasive and highly likely to spread (metastasize). Most benign tumors in other parts of the body are not reportable to the Montana Central Tumor Registry, but benign tumors of the brain and CNS must be reported. Almost half of the reported brain and CNS tumors are benign. However, even benign brain tumors may grow so large that they cause pressure on sensitive parts of the brain and interfere with brain function.

Lymphoma may also affect the brain, although lymphoma arises in the hematopoietic tissue and secondarily invades the brain or other tissues. The brain is a common site for metastasis (spread) of cancer from other parts of the body, especially the lung, breast, kidney, colon, prostate, and melanoma. As many as 20% of all cancer patients may

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experience a metastasis to the brain from a primary tumor elsewhere in the body. There are approximately 10 times as many brain metastases as primary brain tumors.

Brain and CNS tumors have an unusual age distribution. In general, the risk of brain and CNS cancers increases with age although some kinds of brain tumors are more common in children than adults. There is a slight peak in incidence in infancy and early childhood, low incidence through late childhood, the teens, and early adult years, then an increase again after age 40. Brain and CNS tumors are the second most common cancer in children, after leukemia. Two rare types of brain cancer occur almost exclusively in children: two thirds of all cases of neuroblastoma and 95% or more of all cases of retinoblastoma occur in children under five years old. Neuroblastoma is the most common type of cancer in infants under one year of age and accounts for more than one quarter of all cancers in that age group. Retinoblastoma is also more common in infants than other age groups. Nevertheless, the incidence of both of these kinds of cancer is very low in children. In Montana, there were 10 cases of neuroblastoma and two cases of retinoblastoma between 2002 and 2006. The national incidence rates are 9 per million for neuroblastoma and 4 per million for retinoblastoma.³ In Montana, the incidence rates are 3 per million and 1 per million, respectively.⁴ (Pediatric cancer rates are conventionally expressed per million population rather than per 100,000 because of the rarity of pediatric cancer.)



³ <http://seer.cancer.gov/publications/childhood/>

⁴ Montana Central Tumor Registry

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It is difficult to study the epidemiology of brain and CNS tumors because there are so many distinct types and each type is rare. Each type is assumed to have its own risk factors and each type must be studied separately. Many types of brain tumors contain genetic mutations, but the causes of these mutations are unknown. On a population basis, about five percent of brain and CNS tumors are associated with family history and about five percent are associated with known genetic syndromes.

Retinoblastoma and neuroblastoma are clearly associated with genetic mutations, which may be inherited from parents or may occur spontaneously in the embryo. Childhood retinoblastoma is associated with the mutation of a gene that ordinarily acts as a cancer suppressor by regulating normal cell growth and division. When this gene is altered through mutation, it cannot perform its regulatory and cancer suppressing functions.

Therapeutic radiation to the head and neck is associated with an increased risk of developing some kinds of brain cancer later in life.⁵ Occupational exposures to some chemicals (formaldehyde, vinyl chloride, acrylonitrile) may increase the risk of some kinds of brain cancer but results of the studies are not entirely consistent.⁵ In spite of many investigations, there is no credible evidence that cell phone use, living near high-voltage electrical lines, or other exposure to electromagnetic fields confers an increased risk of brain or CNS cancers⁵

Please visit our website at www.cancer.mt.gov

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⁵ <http://www.cancer.gov/cancertopics/wyntk/brain>